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V. A. Alferov, M. S. Beletskiy, Ye. B. Gasilova
All-Union Sci Res Inst of Abrasives and Grinding
Leningrad
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It has been shown that as a result of heating silicon with carbon in a vacuum at 1220 to 1400°, silicon carbide is formed, and that the heating of silicon with carbon at 1510 to 1660 will result in "amorphous" silicon carbide and siloxicon.

A study of the reaction between a molecule of silicon dioxide and three molecules of carbon showed that between 1520 and 1550° a soft, greenish substance is formed which, under X-ray investigation, turned out to be crystalline. The measured picnometric density of the substance was 3.17, its lattice cubic with a constant of 4.36 Å. It was determined that the molecular weight of this compound was 40.05, which corresponds to the molecular weight of silicon carbide. This would suggest that the substance under investigation is a silicon carbide of cubic modification. No supplemental lines, which might indicate the formation of other compounds, were observed on the roentgenograms.

Our results, therefore, do not agree with those presented in the literature (1, 2) on the formation under the conditions described of amorphous silicon carbide and siloxicon. Siloxicon, generally, is a hypothetical compound which has not yet been investigated either crystallographically or roentgenographically; nor have its properties been described.

Specimens of the cubic silicon carbide, prepared by heating pure quartz sand with petroleum coke at 1600° and containing 98.26 to 99.89% SiC, were heated at 1800, 2000, and 2200° in a reduction furnace for one hour, then cooled and investigated roentgenographically.

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The lattice constant of the original specimen was 4.38 Å. For temperatures of 1800, 2000, and 2200°, the constants were, respectively, 4.45, 4.40 and 4.39 Å. The variation here may be explained by the dissolving and subsequent evaporation of impurities. Interference lines showed up only on roentgenograms of specimens heated over 2200°. These were from graphite which appeared in the specimen as a result of the thermal decomposition of the silicon carbide. Silicon was not retained in the specimens because at those temperatures its vapor tension was very high. Comparatively large crystals of hexagonal silicon carbide were observed in sections adjacent to those parts of the furnace which had been cooled.

Analogous results were obtained in the X-ray investigation of Silit resistors. It was established that the original Silit heaters, heated to 2150 to 2200°, consisted of silicon carbide of cubic modification. When they were heated at higher temperatures graphite remained from the silicon carbide and large crystals of hexagonal silicon carbide were again observed in some places separated from the resistors.

On the basis of these facts it must be concluded that the abrasive silicon carbide formed in industrial furnaces is not a product of the direct conversion of cubic silicon carbide in the solid state but, most probably, is the result of crystallization from the gaseous phase. This is also substantiated by the fact that abrasive silicon carbide always appears as well-formed crystals.

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